INTRODUCTION

Numerous studies have shown that affective valence modulates eyeblinks resulting from intense, abrupt, acoustic stimuli. Extending this work, we have demonstrated that somatic (nociceptive flexion reflex), autonomic (skin conductance response, heart rate acceleration), and subjective (pain ratings) reactions resulting from noxious electric sural nerve stimulation are modulated in parallel by affective valence. Specifically, negatively valenced affect enhances pain, nociception, and autonomic responses, and positively valenced affect inhibits them.

The present study examined whether eyeblink reactions resulting from sural nerve stimulation show the same pattern of modulation. To do so, we examined the effects of emotional valence and arousal on eyeblinks resulting from noxious electric stimulations of the sural nerve. Noxious stimuli were assessed while participants viewed IAPS pictures that varied in emotional valence and arousal.

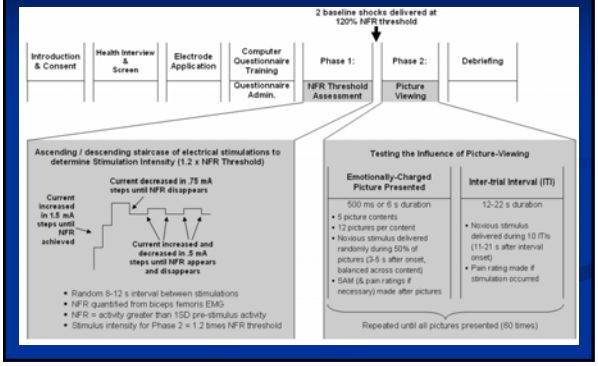
OBJECTIVES

- To determine the independent effects of affective valence and arousal on eyeblink reactions resulting from noxious sural nerve stimulation
- To determine if eyeblink reactions to noxious stimuli are modulated by emotion in the same pattern as somatic, autonomic, and subjective reactions

PARTICIPANTS

- **23 healthy students**
  - Characteristics: Female (*n*=61%), White non-Hispanic (61%), single (96%), unemployed (52%) with an average age of 21 yrs (*SD*=1.79)
- **Exclusion Criteria:**
  - < 18 years of age
  - Current acute illness
  - Cardiovascular, neurological, and/or circulatory problems
  - Recent use of analgesic, antidepressant, anxiolytic, or antihypertensive medication
  - Recent psychological trauma
  - Specific phobia of snakes or spiders
  - Problems healing
  - Raynaud's disease
  - Medical problems exacerbated by stress
- 2 persons withdrew from the study
- 1 person was excluded for equipment failure

PROCEDURE



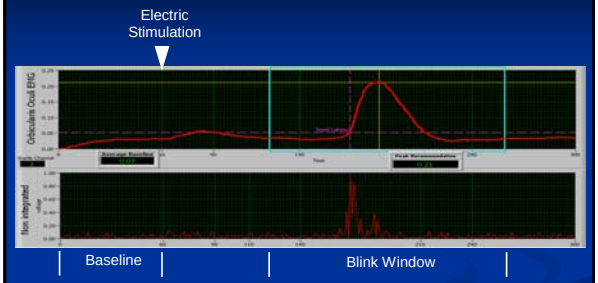
NOXIOUS ELECTRIC STIMULATION

- Stimulating electrodes were attached to the left ankle over the sural nerve.
- Stimulations were 5 pulses of 1 ms duration at 250 Hz
- Stimulus intensity during picture-viewing was 120% nociceptive flexion reflex threshold
- Delivered randomly during and in between pictures (balanced across picture content)

MEASUREMENT OF EYEBLINK

Recording electrodes - left orbicularis oculi muscle

MEASUREMENT OF EYEBLINK

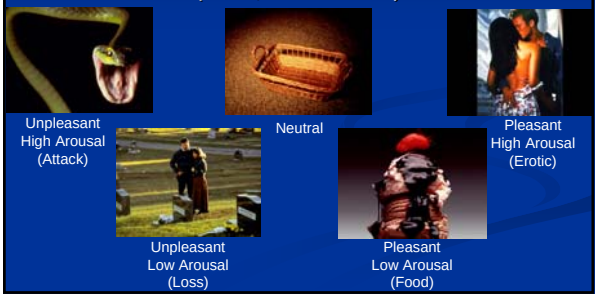


- **Eyeblink magnitude** - subtract average 60 ms prestimulus EMG from the peak activity 60 – 200 ms poststimulation

EMOTION-INDUCTION: Picture-Viewing

The International Affective Picture System

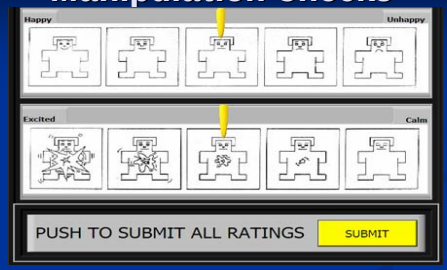
(IAPS; CSEA, 1999)



EMOTION-INDUCTION: Picture-Viewing

- 60 pictures presented in pseudorandom order
  - 12 pictures per content
  - Pictures presented for 6 s or 500 ms
  - Ratings of emotional valence and arousal made after each picture
- Noxious stimulations to sural nerve
  - Delivered 3-5 s following picture onset during 50% of pictures (balanced across content) and 10 Inter-picture intervals

EMOTION-INDUCTION: Manipulation Checks



- **Self-Assessment Manikin (Bradley & Lang, 1994)**
  - **Valence (Pleasure) Ratings: 1 (unhappy) to 9 (happy)**
  - **Arousal ratings: 1 (calm) to 9 (excited)**
  - **Subjective emotional reactions assessed following presentation of each picture**

DATA REDUCTION

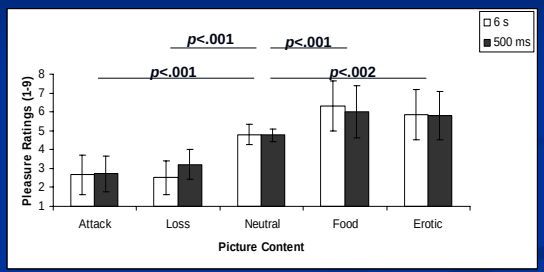
- Eyeblink magnitude = peak activity 60 – 200 ms post-stimulation minus mean 60 ms prestimulus interval EMG
- Eyeblink reactions standardized within individuals (z score) & averaged by picture type

ANALYSES

- Repeated measures ANOVAs with picture content and picture duration as within subjects variables
- Mixed models approach was used to assess ITI habituation
- Fisher's LSD tests were used for *a priori* and follow-up comparisons
- Greenhouse-Geisser corrections were used to overcome sphericity violations
- Partial eta-squared (η^2) reported as effect size

RESULTS: Manipulation Checks

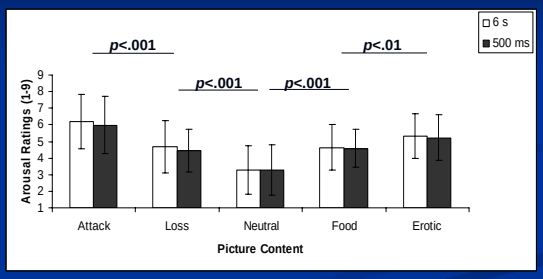
Pictures independently manipulated valence



SAM Pleasure (Valence) Ratings. The effect of picture content was significant, $F(4,76)=65.17$, $p<.001$, $\eta^2=.77$.

RESULTS: Manipulation Checks

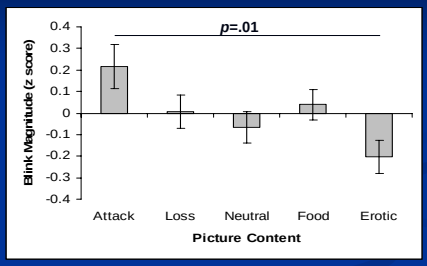
Pictures independently manipulated arousal



Arousal Ratings. The effect of picture content was significant, $F(4,76)=14.86$, $p<.001$, $\eta^2=.44$.

RESULTS: Eyeblink Magnitude

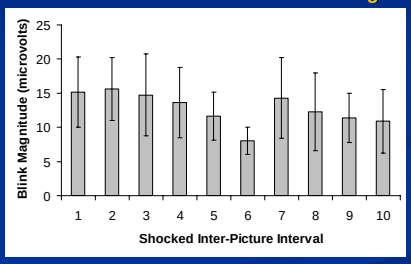
Valence and arousal contributed to eyeblink modulation



Eyeblink Modulation. The effect of picture content was significant, $F(4,76)=2.77$, $p=.046$, $\eta^2=.13$. The effect of picture duration was not significant $F(1,19)=1.82$, $p=.19$, $\eta^2=.09$.

RESULTS: ITI Habituation

Blink Reactions did not habituate during ITIs



ITI Habituation. There were no significant effects of time for blink magnitude $F(9,181)=.23$, $p=.99$.

CONCLUSIONS

- Pictures effectively manipulated affective valence and arousal regardless of picture duration
- Affective valence and arousal independently contributed to the modulation of eyeblink reactions to noxious sural nerve stimulation
  - Highly arousing pleasant pictures led to inhibition of eyeblink reactions, whereas highly arousing unpleasant pictures led to enhancement of eyeblink reactions
- Eyeblink reactions to noxious stimuli are modulated by emotion in the same pattern as the modulation of autonomic, somatic, and subjective reactions to noxious stimulation
- Habituation of ITI blink responses did not occur, implicating a process distinct from a startle response